

Tests with a single WEC unit from the WECfarm project

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The continuous development of affordable high-fidelity numerical models allows the simulation of complex structures, such as wave energy converter farms, that was inconceivable just few years ago. These models have been and are still under an intensive phase of verification and validation in order to quantify their true capabilities. In the wave energy sector there is a global attempt to create a cross validation framework through the “Ocean Energy Systems Task 10” (OES Task 10), but the main objective of this task is limited to simple WEC geometries such as sphere or cylinders. Although it is fundamental to ensure the basic modelling capabilities, an important number of research groups are now capable to simulate farms of wave energy converters, and thus the experimental validation of these numerical simulations is essential.

In the attempt to cover this discrepancy between model availability and validation data availability, Ghent University with the support of several international partners is developing an ambitious test program (the ‘WECfarm’ project) for arrays of wave energy converters. The WECfarm project are a follow-up of the WECwakes project in which up to 25 point absorber WEC types have been tested simultaneously in various array configuration in the wave basin of DHI [1-2].

In order to create an agnostic dataset, the single WEC unit selected for the WECfarm experiments is a single degree of freedom WEC, where the floater is only allowed to move in the vertical direction. The floater is shaped from a flat cylinder (small draft compared with the diameter), in order to stimulate non-linear behavior and therefore challenge the validation of numerical models.

The WECfarm project aims at testing 9 WEC units in different WEC array configurations, but before commissioning the full development of the arrays, it is important to verify that a first single WEC unit properly works both in dry and wet conditions. The verification of the functionality of a single WEC unit has been already carried out at the laboratory of Ghent University in a dry test-bench, while the functionality in wet conditions will be carried out at the Coastal and Off-shore Wave Basin of Aalborg University.

The main objectives of the test campaign are to:

- 1) Verify that the single WEC unit can properly work in normal wave conditions, including DAQ, Motor, Communication and Controller;



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- 2) Verify the applicability of different control strategies in real-time;
- 3) Verify the structural rigidity of the WEC system under extreme wave conditions;
- 4) Verify the quality of the recorded experimental data.

References

- [1] Stratigaki V, Troch P, Stallard T, Forehand D, Kofoed JP, Folley M, et al. Wave basin experiments with large wave energy converter arrays to study interactions between the converters and effects on other users in the sea and the coastal area. *ENERGIES*. 2014;7(2):701–34. (<https://doi.org/10.3390/en7020701>).
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